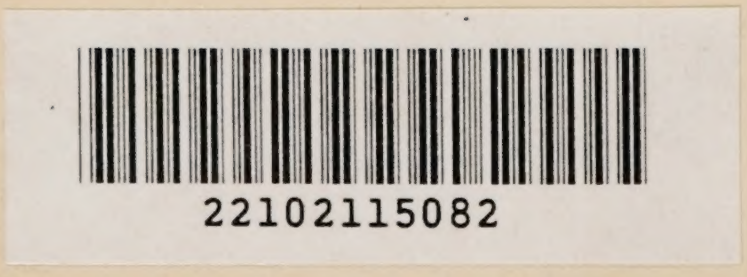
The Surgeon of the Future

J. Bland-Sutton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With the writer's Compliments

ADDRESS IN SURGERY

ON

THE SURGEON OF THE FUTURE

DELIVERED AT THE EIGHTY-SECOND ANNUAL MEETING
OF THE BRITISH MEDICAL ASSOCIATION

BY

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London
ADLARD AND SON, BARTHOLOMEW PRESS
BARTHOLOMEW CLOSE, E.C.

1914

17643421

Printed by Adlard and Son,
London and Dorking.

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ADDRESS IN SURGERY

ON

THE SURGEON OF THE FUTURE

Mr. President, Ladies and Gentlemen,—The perusal of addresses in surgery delivered at annual meetings of the Association during the last ten years leaves an impression on the mind that some of the surgeons who delivered them resembled proud conquerors on a battle-field, vain of their victories, brandishing their swords and sighing for more foes to vanquish. Accounts of battles contain sickening lists of the killed and wounded and longer lists of those who die from infectious diseases in camps; records of surgical procedures always contain a mortality bill even for the most trifling operation.

The art of surgery is probably as ancient as the art of war, and is practised by warlike savages who have never been influenced by civilisation. The antagonistic callings of the soldier and the surgeon have been markedly modified by the progress of science. It is believed by many that the ingenuity exercised in the invention of methods for destroying life will make war impossible, and the discovery of the causes of diseases and the perfection of preventive medicine will render physicians and surgeons unnecessary. The belief in each instance is futile. Soldiers and surgeons will be required as long as civilisation endures; but their methods have undergone great changes and greater

are impending. Gunpowder revolutionised warfare; the discovery of anæsthetics and the invention of the microscope completely changed surgical methods.

Surgery and the Discovery of Anæsthetics.

The enormous impetus which the discovery of anæsthetics gave to surgery threatened to extinguish it as an art, for post-operative suppuration and pyæmia became endemic plagues in all populous cities where the surgeon plied his craft. It was on this unfavourable flood that some of the most notable ventures of modern surgery were launched, but their progress was slow. Traditions and methods die hard! A famous surgeon told me that when he began to perform operations under chloroform an old pupil of Guy's Hospital came in to see a leg amputated under the new conditions. When the surgeon pointed out the merciful nature of anæsthetic sleep and the change it had wrought in the methods of removing limbs, the old fellow sighed, and said he had a fancy for the old ways, and liked to see some blood and sawdust about! Sir William Fergusson delivered some lectures on the progress of anatomy and surgery at the Royal College of Surgeons of England in 1855 and described operations performed at that date in London, in this rough and ready style. You will acquit me of exaggeration when I state that the arena of an operating theatre in the first half of the nineteenth century smacked of the bull-ring, and the board in the old operating theatre, that bore a notice regarding the reservation of the arena for the surgeons and the first two rows of stalls for privileged spectators, recalls the notices *Sol* and *Sombra* in the Plaza de Toros.

In the early stage of a great discovery few men perceive its significance. When anæsthesia began to make progress, although surgeons recognised its importance, many years elapsed before it was fully

utilised. Chloroform had been in constant use for operations before its usefulness in the reduction of dislocations was recognised. Operating theatres had iron bars and racks fixed to the walls and ring-bolts let into the floor for the attachment of cords and pulleys employed in the forcible reduction of dislocated shoulders and hips. In the Middlesex Hospital the dislocation fixtures and tackling were abolished with the old operating theatre in 1895. To-day a dislocated hip is reduced with the help of chloroform without pulleys, almost in the twinkling of an eye. When done expertly it resembles a conjuring trick. Let me briefly describe an actual case to show what harm sometimes followed the use of pulleys in reducing a dislocated hip. In 1889 the chief officer of a ship had his hip dislocated by a derrick-boom falling upon him during a voyage in the Atlantic Ocean. The captain attempted to reduce it. As a preliminary the patient drank half a bottle of brandy and fifty drops of laudanum. Being drunk he was fastened by a perineal band to a ring-bolt on the deck, and ten seamen, under the superintendence of the captain, hauled steadily on the leg. Their efforts were unavailing. Four days later the ship touched the Canary Isles, and the officer was sent ashore; the head of the thigh bone was promptly reduced by a surgeon under chloroform. On recovering the patient was unable to walk without pain. When the limb was extended he felt a pricking pain down the back of the thigh to the knee, then it divided, and "one stream of painful sensations" ran down the back of the leg and the other along the front of the leg to the toes, and the sailor found it hard to kick against the pricks. I saw him in London, and came to the opinion that the efforts of his shipmates had broken the rim of the acetabulum and a spicule of bone interfered with the great sciatic nerve. By means of an incision in the buttock the nerve was exposed

as it issues from the great sciatic foramen. I found a hook-shaped piece of bone on the rim of the acetabulum in such a position that its sharp end pricked the nerve when the limb was extended. This piece of bone was removed. The officer recovered, and reported himself in good health twenty years afterwards.

The utility of chloroform in the diagnosis of hysterical contractures, phantom tumours and spurious pregnancy was its last merit to be appreciated. The surgery of the viscera is one of the remarkable extensions that followed the introduction of anæsthetics. Abdominal organs such as the spleen and omentum were removed when extruded through accidental rents made by knives, spears, swords, scythes, sickles, cart wheels, or similar forms of violence, and extruded intestines were returned with success centuries before the discovery of ether and chloroform. Cæsarean section was successfully performed in Roman times, and many a child, to use Shakespeare's phrase, "was from its mother's womb untimely ripp'd." This form of delivery has been effected by midwives and butchers; by a patient on herself, and by the horn of a mad bull; in some instances mother and child survived. The success that followed this inartistic mode of delivery is instructive; forty years ago Cæsarean section had an astounding mortality when performed by surgeons, whilst the spayer and gelder carried out his calling with almost invariable success. Lister unravelled the riddle. To-day wounds made and closed in the course of a surgical operation unite with a certainty that ceases to attract attention. Surgeons rarely pause to think on what would happen if surgical wounds failed to heal. In the pioneer days of abdominal surgery the incisions often failed to unite, and such patients frequently died. I shall later on place facts before you to show that failure of intestinal wounds to unite is one cause of the high mortality following operations for

cancer of the colon. Union of healthy intestine takes place quickly and perfectly.

New Diseases and the Plagues of Egypt.

We marvel to-day at the frequency of the disease called appendicitis that became endemic in great centres of civilization in the last quarter of the nineteenth century. This disease occurred sporadically, and had been known as perityphlitis and iliac abscess for many years, but the cause of the present epidemic has not been discovered by pathologists or bacteriologists. A study of the history of diseases shows that they wax and wane. In the fourteenth century lepers were common, and leper houses were as numerous in Europe and the British Isles as lunatic asylums to-day. Leprosy lingered longest in Scotland. I thought it probable, reflecting on the prevalence of leprosy in Iceland and Norway, that there may be some lepers in the northern islands of Scotland. I have been assured on reliable authority that there is no leprosy in the Orkneys. Whilst pondering on the absence of this disease in Britain, doubts arose in my mind on reading in Lord Strathcona's will ('The Times,' May 14th, 1914) a bequest of £5,000 to the Right Hon. John Burns for a home for fifty lepers in the United Kingdom, none of the sum to be expended upon lepers coming into the kingdom.

In Europe, generally, leprosy diminished greatly without any recognised cause in the fifteenth century, but its decline was coincident with a great increase in syphilis. One disease tramples out another. In the vegetable world grass, and what we call weeds and the Bible tares, choke the nobler plants. When from accidental causes weeds are held in check, the suppressed plants revive and flourish again. It was a great discovery to detect the part played by insects as unconscious pimps in the fertilisation of flowers. No

one can doubt that the disappearance of many species of flowering plants and variations in the abundance or the scarcity of particular species of flowering plants depend not merely on favouring conditions of weather, but on the abundance or scarcity of the insects that act as vectors of the precious pollen from the flowers of one plant to the flowers of another of the same species. Diseases supply parallels. To-day we are staggered by the important observations that many infections are conveyed from man to man, man to beast, and from beast to man by insect agency. Flies act as vectors of the parasites of sleeping sickness, gnats spread filaria, malaria, and yellow fever; fleas infect man with plague; and bugs can convey the leprosy bacillus.

The famous plagues of Egypt, fraught with such important consequences to the Israelites, were intensified by flies. When the narrative is considered in the light of modern knowledge it is a fair inference that the dust storm which fouled the Nile water and rendered it undrinkable killed the fishes and caused the frogs to take refuge on the land. The dead fishes and frogs provided breeding places for flies, and they were hatched out in myriads.

During the last decade the fly has come to be regarded as a conveyor of disease, and the indictment is very strong. The biting fly conveys parasites in its proboscis, and the common non-biting fly carries on its body, legs and wings the infective agents of typhoid fever, tuberculosis, ophthalmia, and perhaps smallpox. The sequence of the Mosaic visitations is significant; the plague of flies was followed by a murrain among beasts and boils and blains on the Egyptians. The death of the children was the last plague, and it is the last to be explained by modern science. Dr. E. H. Ross was medical officer in Cairo in 1909. He tells us the spring of that year was ushered in by a heat wave on May 1st, and the temperature rose to 102° F. in the shade. Fourteen days later the greatest plague of

flies ever remembered appeared in the city. Food, milk, and fruit were contaminated by them. In two months 3,000 children under 5 years succumbed to enteritis—a disease due to infection. It is not an unreasonable assumption that the death of the Egyptian children, which induced Pharaoh to let the Children of Israel go, was due to an epidemic of infantile enteritis spread by an enormous swarm of "divers sorts of flies."

One of the greatest plagues which troubled surgeons and destroyed millions of lives is known as suppuration or pyosis; it was spread widely by surgeons. When Pasteur discovered the cause of fermentation and Lister gave this discovery a practical application in the daily work of the surgeon, it was not suspected for many years that the most dangerous items in a surgical operation were the infected instruments and the fingers of the surgeon. The importance of this observation cannot be over-estimated; surgeons admit its truth by wearing sterilised rubber gloves when performing operations.

The Microscope in Surgery.

It is usual to ascribe the remarkable progress of surgery to the discovery of anæsthesia and the perfection of methods designed to prevent wound infection, but we must not forget the most important was the invention of the microscope; without its assistance the minute bodies which effect such great changes in organic and inorganic nature, and cause so many varieties of infective disease in animals and plants, would have remained not only hidden but unsuspected. This important instrument of research, perfected by earnest workers mocked at as "brass and glass men," is now indispensable in clinical research. Every improvement in the construction of the microscope has led to an increase in knowledge of the cause of disease. It has

also become a means of popular instruction and amusement. Even embryologic processes are displayed to interested pleasure seekers on kinematographic films in "picture palaces," and school-children are instructed in physiology, including the microscopic features of the blood. The numerical estimation of blood corpuscles is a regular exercise for the clinical clerk, and corpuscles are scrutinised in the laboratory by experts with microscopes as diligently as physicists examine the solar disc with telescopes for sunspots. Specks in the white and in the red corpuscles, barely visible to the highest powers of the microscope, may have more influence for evil on the health of a community than a sunspot big enough to be visible to the naked eye exercises on the weather.

Derangements of the functions of blood-forming organs, especially the red marrow, and the significance of an excessive production of leucocytes have come to be so thoroughly appreciated by surgeons that, under certain conditions, an excessive proportion of white corpuscles in the blood is a more emphatic bar to a surgical operation than sugar in the urine. It is in this direction that the increase of pathological knowledge, especially the form of it called clinical pathology, will influence operative surgery in the future. The light microscopic studies of the blood throw on leukæmia acts as a danger signal to the surgeon when contemplating the removal of an enlarged spleen. The extirpation of a leukæmic spleen is always followed by death, and this experience is crystallised in practice, for an abdominal tumour resembling a spleen always suggests a blood count.

The Influence of Chemiotherapy on the Surgery of the Central Nervous System.

Disease was formerly regarded as something that entered the body, and the idea of evil spirits or devils

entering men and women led, even before the dawn of Christianity, to surgical practice consistent with such belief, for there is evidence that the skulls of epileptics were trephined to afford incarcerated evil spirits a chance of escape. Fifty years ago our knowledge of regarding the physical condition of the brain and spinal cord was of an elementary kind. It was the custom to teach that the cerebro-spinal fluid served as a waterbed for the brain in order to preserve it from harmful concussions. In my student days this teleological explanation tickled my fancy, and I suggested to the lecturer on anatomy when he waxed enthusiastic, after the style of Hilton, on this wise precaution of nature, that the explanation was absurd, for the relative bulk of brain and cerebro-spinal fluid resembled an ironclad in a duck pond. Now cerebro-spinal fluid is used as a medium for inducing temporary paraplegic analgesia—a method of conscious anæsthesia of great advantage to the surgeon when he is called upon to operate in conditions where a general anæsthetic would be attended with unusual risks. The diagnostic importance of cerebro-spinal fluid obtained by lumbar puncture is not only great, but its utility is increasing. Examination of samples of the cerebro-spinal fluid obtained by tapping the spinal theca is a routine in diagnosis.

Flexner's demonstrations, that the olfactory nerves are routes by which the microbes of influenza and cerebro-spinal fever infect the central nervous system, add a new interest to the physiology of those remarkable secretory organs in the brain called choroid plexuses. In discussing influenzal meningitis he tells us that the fluid secreted by the choroid plexuses in infected monkeys contains an antiserum which escapes by the meningeal veins, and it may become possible to arrest the development of bacilli in the blood by means of compounds injected into the cerebro-spinal fluid. Here is a method of specific therapy unsuspected in our

wildest dreams: Science transforming the cerebro-spinal fluid into a pool of Bethesda! Enterprising surgeons are now devising methods by which they can "trouble" the pool to the best advantage. No one can doubt that bacteriologists are in their methods as ingenious as surgeons. Crowe and Cushing ascertained that urotropin (hexamethylenamin) given by the mouth is excreted into the cerebro-spinal fluid and inhibits the growth of pyogenic bacteria. Surgeons turn this observation into practical account; it is now the custom to administer urotropin internally two or three days before an operation on the brain or spinal cord, and continuing it for a few days afterwards. Post-operative meningitis occurs occasionally in spite of it!

Orr and Rows have found that micro-organisms use neural lymphatics as routes for infecting the cord. Thus a bedsore, or any septic area of the skin, can lead to an infection of the spinal cord at a spot corresponding to the roots of origin of the implicated nerves. This will intensify the interest of surgeons in neuritis complicating septic lesions. The brilliant demonstrations that spirochætes use the lymphatics of nerves as avenues for invading the spinal cord will modify the treatment of syphilitic diseases of the cord. Intrathecal injections of salvarsan, in common with all arsenical compounds, irritate the spinal cord. To overcome this difficulty salvarsanised serum obtained from the patient is injected into his cerebro-spinal fluid and tolerated. This is a good example of practical ingenuity.

The results of surgical enterprise on cerebral tumours are unsatisfactory; the mortality is great and the condition of the survivors in many instances sad. The indefiniteness of gliomatous formations makes them extremely unfavourable for operation, to say nothing of the difficulty in localising cerebral tumours in non-motor areas. It is probable that compounds will be discovered that can be injected into the cerebro-spinal fluid and cause glioma to shrivel in the same way that

gummas disappear under potassium iodide, mercury or salvarsan, and thus abolish some of the most unpromising operations of modern surgery.

Surgical Gambling with Malignant Disease.

Investigations of the minute structure of morbid growths have been mainly useful in separating the so-called benign tumours from those which inevitably destroy life. Thirty years ago the two groups were regarded as distinct. It is true that type forms can be distinguished as innocent or malignant, but each genus of the so-called innocent group, with the exception of lipomas, contains species in which the histological features of innocency shade away into those indicating malignancy. This is a matter of great importance when a declaration of malignancy entails the sacrifice of an organ or a limb. The horror patients entertain of malignant disease and the stigma they think it imprints on the family reputation lead to willing submission when the surgeon offers operative treatment. It is an impression deeply ingrained in the profession that the presence of malignant disease justifies an operation, however extensive or dangerous, for its relief. Let us satisfy ourselves that surgical gambling with malignant disease is justified. There are two organs in the body often the seat of cancer and often attacked by surgeons —the uterus and colon—in connection with which this question may be fairly considered.

The results of removal of the uterus for cancer in its neck are by no means uniform even when the conditions are apparently similar. The microscopic features of cancerous growths do not help in explaining variations in the clinical course of the disease. There are intrinsic and extrinsic factors concerned in estimating the malignancy of uterine cancer which have only recently been appreciated. Our predecessors in the art of surgery recognised a remarkable alteration in the appearance of

patients the subjects of advanced malignant disease, which they expressed by the phrase "cancerous cachexia." This "bad habit" of body has no special relation to cancer; it is due to the entrance into the circulating blood of toxic substances secreted by the bacteria and cocci which colonise cancerous growths in exposed situations. The relation of bacteria to cancer is a matter of first-rate importance to the surgeon, and influences his work very markedly. I find, as a rule, that non-ulcerating cancers of the breast are sterile. Cancer of the tongue usually swarms with streptococci, and the neck of the uterus when cancerous is colonised by staphylococci or streptococci and the coli group. This led me to make bacteriological investigations of the necks of cancerous uteri before undertaking their removal; I quickly found that the fate of a patient submitted to operation for this disease depends not so much on the skill of the surgeon as on the nature of the infecting micro-organism. Many patients submitted to hysterectomy for cancer of the neck of the uterus die within a few days of the operation from septic peritonitis, pulmonary embolism, or acute bacteriæmia if the cancerous tissues are colonised by streptococci.

In the general hospitals of London during the year 1912 the mortality of radical hysterectomy for cancer of the neck of the uterus varied from 10 to 48 per cent. This forms a striking contrast to hysterectomy for fibroids of the uterus, for the mortality of this operation in the general hospitals of London is about 2 per cent., the difference being almost entirely due to the presence of bacteria and cocci in the cancerous tissues. It cannot be too emphatically stated that the virulence of cancer, as a rule, depends on its septicity, and cancers in exposed situations are rapidly destroyed by bacteria.

Sepsis in Relation to Cancer of the Large Intestine.

The relationship of sepsis and cancer is an important matter for the surgeon. During the last ten years there has been great activity in developing radical measures for the treatment of cancer of the large intestine. The results are not gratifying. Resections of the cæcum, or portions of the colon, are attended with a high rate of mortality, and of those who survive operation early recurrence or dissemination is the rule. Surgeons know this, and in order to improve the results of operative treatment painstaking investigations have been made on the distribution of the blood- and lymph-vessels of the colon. In spite of much admirable work and surgical enterprise, cancer of the large intestine is as opprobrious to the surgeon as hysterectomy for cancer of the neck of the uterus to the gynæcologist, and for the same reason—sepsis. The mortality of radical operations for cancer of the cæcum and colon in London during 1912 was 30 per cent. In the London Hospital during the years 1901–11 resection of cancerous portions of the large bowel was performed on 95 patients; 49 recovered and 46 died. (Sir Frederic Eve.) In these days of boastful surgery this may be called a superlative death-rate.

The radical method of dealing with cancer of the colon consists in free resection of the cancerous portion in favourable cases; this requires a complicated operation for the reunion of the bowel, entailing a sutural junction that must be not only watertight but gas-tight. One of the first requisites for immediate union is the absence of pyogenic bacteria. In operations for intestinal anastomosis success depends on early and firm union of the apposed surfaces of the bowel. There is nothing more amazing in relation to the healing of wounds than the rapidity with which peritoneal surfaces join when they are carefully sewn together with sterile sutures. In regions of the gastro-intestinal tract free

from pyogenic bacteria union occurs after surgical operations safely and quickly; thus a gastro-jejunostomy in the hands of competent surgeons is devoid of risk from septic peritonitis. How different the picture for radical operations performed for cancer of the colon! Septic peritonitis destroys the lives of at least 30 per cent. of those who submit to it. Death is due to septic peritonitis from infection during operation, leakage at the junctions, or failure of union due to the colon bacillus and its congeners.

Cancer of the colon is an extremely insidious disease; in the early stages it is symptomless until it becomes septic or obstructs the flow of fæces, then the patient complains of pain. When cancer becomes septic it sloughs and bleeds. Infected cancer impairs the patient's health because the toxins brewed by the schizomycetes colonising it enter the circulation. Colic cancer sometimes leads to abscess when it is infected by the coli group. The frequency with which visceral cancer mimics inflammatory conditions and misleads physicians and surgeons alike is due to sepsis. The appreciation of the causes of failure in the surgical treatment of colic cancer should exercise some influence for good. Statistics indicate that the risks of operations performed for cancer of the colon are as great as for the operations of general surgery in pre-Listerian days, with this difference—the mortality of that period was due to sepsis from infection of the wound that often arose from the use of dirty sponges, instruments, sutures, and the septic fingers of the surgeon and assistants. In operations on cancerous viscera the diseased tissues are already infected, and taint the fingers and instruments of the surgeon, hence the danger of such operations.

Surgical Coquetry.

It is by no means uncommon to see surgeons clad in sterilised overalls, gloves, caps, masks, and top-boots,

resecting a cancerous segment of colon swarming with pyogenic micro-organisms. This can only be described as surgical coquetry. Some of our methods for destroying bacteria in the course of an operation are almost as clumsy as attempts to kill fleas with bludgeons.

In order to improve the results of operations for visceral cancer means must be devised for sterilising them, or a specific remedy found for cancer. There are indications that both methods will be available. Cancerous organs are sometimes submitted to the action of radium as a preliminary to operation, and histological examinations of malignant tumours affected by radium emanations show that the gamma rays find distinctions in tissue cells imperceptible to the microscope. We need a compound which can be introduced into the circulation to destroy the streptococcus and its kind. This is no idle dream. Huxley suggested that it would become possible in view of the discoveries in therapeutics "to introduce into the economy a molecular mechanism which, like a very cunningly contrived torpedo, shall find its way to some particular group of living elements, and cause an explosion among them, leaving the rest untouched." This sounded fantastical in 1881, but Ehrlich has discovered "molecular mechanisms" more subtle. There are drugs (organotropic) which injuriously affect the organs of the body and fasten on them like aniline staining reagents cling to special tissues. He speaks of compounds that injure the intestinal tract of mice, and they die from profuse diarrhœa. Sometimes the red blood-corpuscles are attacked, and the animal dies from severe anæmia. Curious drug affinities occur in the central nervous system; in mice the vestibular nerve is attacked, and they gyrate like Japanese waltzing mice. The derivatives of phenylarsin acid attack the optic nerve, and large doses of atoxyl produce blindness.

What surgeons urgently need is a molecular compound which will either kill the bacteria and cocci that

colonise cancer or neutralise their harmful toxins in the same way that salvarsan renders the spirochætes inert without destroying the organs or tissues of their host.

The Surgeon of the Future.

In pre-Listerian days the path to surgery lay through the dissecting room. A thorough practical knowledge of the anatomy of man was and is indispensable to a sound surgeon. Many surgeons whose names are prominent in the history of surgery—from John Hunter to Fergusson—taught anatomy by dissection. Surgeons no longer act as demonstrators of anatomy or conduct post-mortem examinations; the principles of antiseptic surgery forbid such occupations. The practical training in the dissecting room and post-mortem room teaches men something they cannot learn from books—the appreciation of tissue; this means, in plain terms, the power to recognise organs and tissues, normal and abnormal, at sight or by touch in the course of an operation.

Surgeons are of two types: they are either craftsmen or biologists. The surgical craftsman invents variations in technique—metal plates, wires, and screws for bones; or fancy methods of suturing wounds. Some expend their ingenuity on surgical cutlery and improve the knives and needles. The utility of a simple tool such as the clip forceps is inestimable. In spite of much ingenuity among surgeons an ideal ligature material awaits discovery. Clever contrivances like the laryngoscope, bronchoscope, and cystoscope have revolutionised special branches of surgery. Another useful instrument, the œsophagoscope, requires for its successful use a surgeon with the instincts of the sword-swallower and the eye of a hawk. Recently, through the kindness of my colleague, Alfred Johnson, I witnessed through the cystoscope a stone slowly extruded from the vesical orifice of the ureter.

The biological surgeon studies pathology in its broadest aspects and investigates, in the laboratory, problems of morbid anatomy and bacteriology. The diagnostic value of reports issued from the laboratory by the pathologist and the bacteriologist to be of value must be estimated with the help of clinical experience. If the surgeon has had no experience in bacteriological methods he must accept the reports from the laboratory with the hopefulness of a patient swallowing physic compounded from a prescription he does not understand and which he is often unable to read. The training of surgeons in clinical pathology is of great importance, and it requires little foresight to recognise that for men ambitious to attain high places in surgery the high road lies through the pathological institute.

Morbid histology has been and still is of great use in classification, diagnosis, and prognosis of morbid growths; for a knowledge of their cause new methods are required. For these we fix our attention on the men along the sky-line—bacteriologists, experimental physiologists, physiological chemists and physicists; the future lies with them. As it is of the utmost importance that surgeons shall have a practical knowledge of clinical pathology, it becomes essential to bring the wards, operating theatres, and laboratories into the closest intimacy. From this union of workers means will be found for curing diseased organs by chemiotherapy rather than by extirpating them. Until the right compound for curing cancer has been discovered surgeons will continue to excise cancerous viscera, and this makes it more necessary to discover means for ridding cancer of pyogenic bacteria.

The skill, ability, and dexterity with which surgeons remove a kidney, the uterus, or perform extensive resection of the intestine, great and small, can be witnessed almost daily in the splendid hospitals of large cities, but surgical effort is handicapped by streptococci

and the coli group, which are very resistant to chemiotherapy. There is something fascinating in submitting septic morbid growths to what Ehrlich picturesquely terms a "bacteriological siege." Our difficulty is to destroy these seeds of disease without serious damage to the organs and the delicate tissues in which they flourish. The antiseptic solutions employed against bacteria are powerful cell poisons. We need therapeutic agents which destroy parasites, but do not kill the tissues of the host. Acute minds are busy with these problems, and surgeons may hope to remove visceral cancer with no more risks than attend gastro-jejunostomy or hysterectomy for fibroids.

The magical effects of salvarsan on the lesions of syphilis, acute and chronic, lead us to hope that this compound will assist in the elimination of cancer of the mouth and tongue, for in these situations cancer is often engrafted on chronic syphilitic lesions. It is reasonable to believe that within a few years surgeons will notice a marked decrease in the number of men with cancer of the lips, gum, tongue, and pharynx, and of women with cancer of the vulva. The extinction of these forms of cancer will relieve surgeons of some of the most distressing and unsatisfactory operations they are called upon to perform.

In regard to the cure of malignant disease, there is most hope in chemiotherapy. In detecting the cause of cancer histology has proved a false dawn, but, like that peculiar light which precedes the dawn in the tropics, it is very fascinating. Who can tell how long we shall have to wait for the real dawn! We need not despair; the zeal, enthusiasm, and acumen of laboratory workers fill us with the hope that the ideal of all practitioners of medicine and surgery is attainable—the control of all forms of infective disease.

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